

## CLAIMS

What is claimed is:

- 5 1. A method for modeling a behavior of an electrical circuit, comprising:  
forming a trained neural network which models the behavior of the  
electrical circuit.
- 10 2. A method as in claim 1, comprising:  
statistically covering an entire space for the behavior of the electrical  
circuit.
- 15 3. A method as in claim 2, wherein fully enumerating coverage of the entire  
space would require more than a predetermined computation time.
- 20 4. A method as in claim 3, wherein the predetermined computation time is one  
week.
5. A method as in claim 1, wherein the behavior of the electrical circuit  
comprises power consumption of the electrical circuit.
- 25 6. A method as in claim 5, wherein the power consumption of the electrical  
circuit comprises leakage power of the electrical circuit and switching energy of  
the electrical circuit.

7. A method as in claim 1, comprising:

using the trained neural network to form a profile of current versus time for the electrical circuit.

5 8. A method as in claim 1, further comprising:

using the trained neural network to provide input data to a second neural network to form a second trained neural network, wherein the second trained neural network models the behavior of a second circuit, and wherein the second circuit comprises the electrical circuit and other circuitry.

9. A method as in claim 1, wherein the step of forming the trained neural network comprises:

using a non-neural network model of the electrical circuit to generate input data for neural network training.

10. A method as in claim 9, wherein the step of forming the trained neural network further comprises:

using the input data to train a neural network to produce the trained neural network.

11. A method as in claim 9, further comprising:

using the input data to train a second neural network.

12. A method for fully modeling a behavior of at least a portion of an electrical circuit, comprising:

selectively modeling the behavior of a portion of the electrical circuit in order to generate a first plurality of cluster values for the behavior of the portion of the electrical circuit;

training a first neural network to form a first trained neural network; generating a first plurality of cluster probabilities using the first trained neural network; and

using the first plurality of cluster probabilities and the first plurality of cluster values, fully modeling the behavior of the portion of the electrical circuit.

13. A method as in claim 12, wherein the behavior comprises power consumption.

14. A method as in claim 13, wherein the power consumption comprises leakage power and switching energy.

15. A method as in claim 12, further comprising:

using the trained neural network to form a profile of current versus time for the portion of the electrical circuit.

16. A method as in claim 12, further comprising:  
selectively modeling the behavior of the portion of the electrical circuit to  
produce input data for a higher level of modeling;  
using the input data to generate a second plurality of cluster values for the  
behavior of the electrical circuit;  
training a second neural network to form a second trained neural network;  
generating a second plurality of cluster probabilities using the second  
neural network; and  
using the second plurality of cluster probabilities and the second plurality  
of cluster values, fully modeling the behavior of the electrical circuit.

17. A method as in claim 12, further comprising:  
performing feature extraction on inputs to the first neural network and on  
inputs to the first trained neural network.

18. A method for modeling power consumption behavior of an electrical  
circuit, comprising:  
generating a plurality of cluster power values for the electrical circuit;  
training a neural network to form a trained neural network;  
generating a plurality of cluster probabilities using the trained neural  
network; and  
using the plurality of cluster probabilities and the plurality of cluster  
values, modeling the behavior of the electrical circuit.

19. A method as in claim 18, wherein the power consumption behavior of the electrical circuit comprises a leakage power component and a switching energy component.

5 20. A method as in claim 18, comprising:

using the trained neural network to form a profile of current versus time for the electrical circuit.

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